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Log Sills - A Solution to a Fish Passage Problem

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I. INTRODUCTION

Highway drainage structures often present impassable barriers or drastically limit the migration of anadromous fish. Improper grade and/or alignment often creates unfavorable water velocities or a "jump" that may be too high to allow migrating salmon and trout to pass into the structure. Adequate fish passage conditions may be created, however, by means of baffles, sills, dams, weirs, reinstallation or replacement of the structure by a bridge (Anderson, 1970) (BLM Manual 6763). One solution to the problem is discussed here.

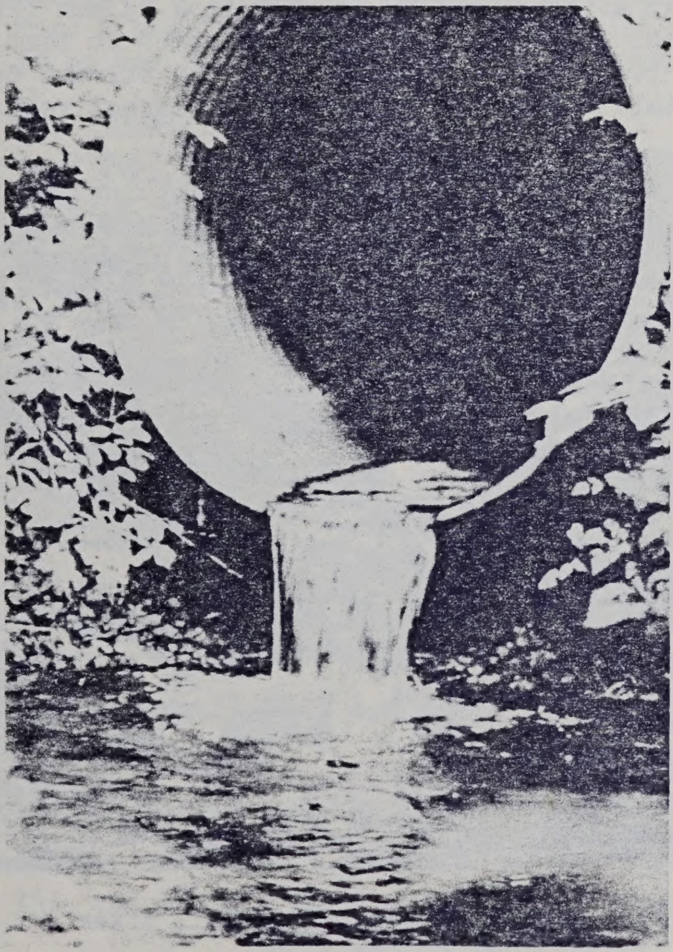

Illustration 1. Fan Creek culvert outfall before installation of log weir

II. BACKGROUND

A culvert installation on Fan Creek, 47 yards upstream from its confluence with the Nestucca River in Western Oregon, was identified as a partial block to migrating salmon, steelhead and cutthroat trout. When the Nestucca River access road was constructed, a 72-inch diameter, round, corrugated metal pipe was installed approximately 24 inches above stream grade. This eventually created a "jump" into the culvert of approximately 30 inches. (Photo Illustration 1.) Recent measurements by the Federal Highway Administration show the culvert is 94 feet long and on a gradient of 1.3 per cent. Salem District personnel and biologists of the State of Oregon Fish and Game Commissions suggested that a log sill, gabion or concrete sill be placed below Fan Creek culvert to reduce the jump to 10 inches or less, a height easily passed by adult salmon, steelhead and most cutthroat trout. Bureau and Federal Highway Administration road maintenance personnel installed a log sill in the fall of 1970 at a cost of approximately $250.

III. DESCRIPTION

The sill log selected was a 20-foot section of a 30-inch diameter second-growth Douglas-fir. After minor excavation on each stream bank, the log was placed across the stream approximately 12 feet from the discharge end of the culvert. After the log was in place, large boulders were placed on each end and ten large burlap bags filled with sand were placed under the upstream side of the log to prevent undermining. Hog wire can also be used to prevent undermining (BLM Manual 6763.25).

A rectangular notch approximately 5 inches deep by 18 inches wide was cut in the log to provide an attracting flow to migrating salmon (Photo Illustration 2.). A pool was excavated below the notch so that migrating fish could easily pass over the log. Pools below the culvert outfall and log sill are approximately 4 feet and 2 feet deep, respectively.

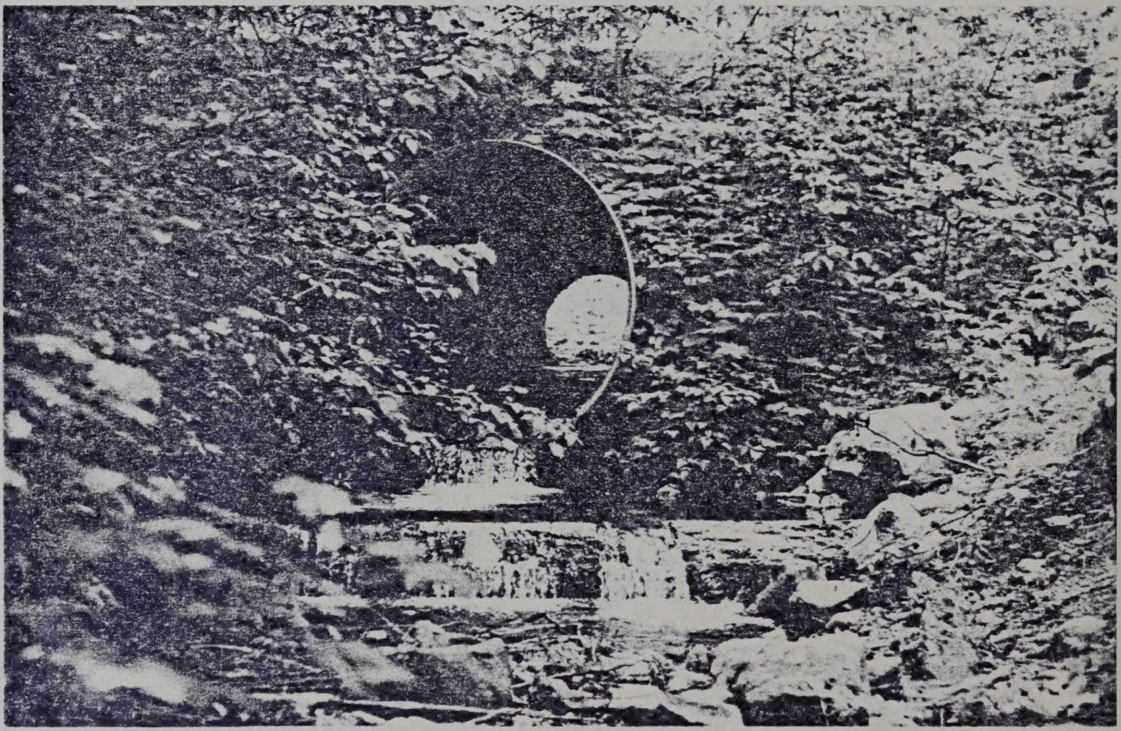

Illustration 2. Fan Creek culvert outfall after installation of log weir

IV. EVALUATION

There are limited operational results available thus far; however, the economics and efficiency of the log sill are worthy of discussion. It was estimated that resetting the culvert would cost nearly $10,000. Although little information exists to substantiate longevity of log sills, recent observations of similar structures in Cherry Creek, a tributary to the Alsea River in Western Oregon, indicate some log weirs to be operational and in good condition nine years after installation. It is therefore logical to assume that this installation will operate for a number of years and is a reasonable alternative to reinstallation of the drainage structure.

Several times during the 1970-71 winter, high flows of water were observed flowing over the log without apparent damage. Coho salmon and steelhead trout were observed swimming over the log sill and into Fan Creek culvert. The pools below the culvert outfall and log sill are also providing rearing habitat for juvenile steelhead, coho salmon, and cutthroat trout. One year after installation the log sill is operating as intended and appears to be one solution to a man-made fish passage problem.

V. SUMMARY

Although not a permanent solution, it appears that log sills may be used in temporarily solving fish passage problems below some improperly placed highway drainage structures. This solution may be done at a considerably lower cost than reinstallation of the structure. However, proper culvert installation cannot be overemphasized. Additional structures to insure passage of fish would be unnecessary if stream crossing facilities were properly designed and installed using proper guidelines to prevent disruption of fish migration.

REFERENCES

(1) Anderson, John W. 1970. Gold Creek Fish Passage Structure. Bureau of Land Management Technical Note.

(2) Bureau of Land Management. Manual 5110 - Stream Protection. 1969. p. 11

(3) Bureau of Land Management. Manual 6760 - Stream Preservation and Improvement. 1968. p. 49

(4) Oregon Fish Commission. 1971. Evaluation of Cherry Creek Weirs, Five Rivers, Alsea River, Oregon. Intradepartment Memo June 22, 1971.